Revision Structure of SE (Mechanical)

FIRST TERM

CODE	SUBJECT	TEACHING SCHEME		EXAMINATION SCHEME				
		Lect.	Pract/Dwg	Paper	TW	Oral	Pr	Total
202041	Applied Thermodynamics	4	2	100	25	50	-	175
202042	Metallurgy	4	2	100	25	-	-	125
202043	Fluid Mechanics	4	2	100	25	50	-	175
202044	Machine Drawing & Computer Graphics	1	4	-	25	-	50	75
207002	Engineering Mathematics III	4	-	100	-	-	-	100
202046	Manufacturing Processes	3	-	100	-	-		100
Total of First Term		**20**	**10**	**500**	**100**	**100**	**50**	**750**

SECOND TERM

CODE	SUBJECT	TEACHING SCHEME		EXAMINATION SCHEME				
		Lect.	Pract/Dwg	Paper	TW	Oral	Pr	Total
202047	Theory of Machines-I **	4	2	100	50	-	-	150
202048	IC Engines	4	2	100	25	-	50	175
202049	Geometric Modelling	-	4	-	25	-	50	75
203050	Electrical Technology	4	2	100	25	-	-	125
202051	Strength of M/c. Element	4	-	100	-	-	-	100
202052	Production Technology	3	-	100	-	-		100
215053	Workshop Practice	-	2	-	25	-	-	25
Total of Second Term		**19**	**12**	**500**	**150**	**-**	**100**	**750**

** Theory paper of 4 Hours duration.

TE Mechanical-First Term- No Change

202041 Applied Thermodynamics

Teaching scheme: Examination Scheme:
Lectures: 4 Hrs/week Theory: 100 marks
Practical: 2 Hrs/week Term work: 25 marks
Oral: 50 Marks

SECTION-I

Unit 1: **(8 Hrs)**

Laws of Thermodynamics
First Law of Thermodynamics,
Second Law of Thermodynamics,
Clausius statement and Kelvin-Plank statement
Equivalence of Kelvin-Plank statement and Clausius statement
Perpectual Motion Machine I & II
Concept of Reversibility & reversible cycle.
Entropy Entropy as a property, Clausius inequality, principle of increase of Entropy

Unit 2: **(8 Hrs)**

Availability
Available and unavailable energy, concept of availability, availability of heat source at constant temperature and variable temperature **(Numerical)**
Availability of non flow and steady flow systems, Helmholtz and Gibbs function, irreversibility and second law efficiency
Ideal Gas Properties and Processes
Ideal Gas definition
Gas Laws: Boyle's law, Charle's law, Avagadro's Law
Equation of State
Specific Gas constant and Universal Gas constant
Ideal gas processes- on P-V and T-S diagrams
Constant Pressure, Constant Volume, Isothermal, Adiabatic, Polytropic,
Throttling Processes.
Calculations of heat transfer, work done, internal energy. Change in entropy, enthalpy **(Numerical)**

Unit 3: **(8 HRS)**

Properties of Steam and Vapor Processes
Formation of steam, Phase changes, Properties of steam,
Use of Steam Tables,

Study of P-V, T-S and Mollier diagram for steam,
Dryness fraction and its determination, Study of steam calorimeters (Separating, Throttling and combined)
Non-flow and Steady flow vapour processes,
Change of properties, Work and heat transfer.

Vapour Power Cycles

Carnot cycle, Rankine cycle,
Comparision of Carnot cycle and Rankine cycle,
Efficiency of Rankine cycle ,
Relative efficiency, Effect of superheat, boiler and condenser pressure on performance of Rankine cycle.
Reheat & Regenerative cycle (no numerical, for reheat & regenerative)

Unit 4: **(8Hrs)**

Fuels and Combustion

Types of fuels, Proximate and ultimate analysis of fuel,
Combustion theory, Combustion Equations
Theoretical, excess air and equivalence ratio.
Analysis of products of combustion
Calorific value – HCV & LCV. Bomb and Boy's gas calorimeters (Numerical)

UNIT 5: -
(8Hrs)

AIR COMPRESSORS: -

1) Reciprocating Air Compressor

Types of compressor valves,
Single stage compressor – computation of work done, isothermal efficiency, effect of clearance volume, volumetric efficiency
Free air delivery
Theoretical and actual indicator diagram,

2) **Multistage compressors –**

Constructional details of multistage compressors,
Need of multistage, Computation of work done, Volumetric efficiency,
Condition for maximum efficiency,
Inter cooling and after cooling (**numericals**)
Theoretical and actual indicator diagram for multi stage compressors,
Capacity control of compressors.

3) Rotary Air Compressors: -

Classification, Difference between compressors and blowers, Working and constructional details of roots blower, Screw type and vane type compressors (Numerical)

Unit 6:

1) Steam Generators: -
Classification,
Constructional details of low pressure boilers,
Features of high pressure (power) boilers,
Location, Construction and working principle of boiler
Boiler mountings and accessories
Introduction to IBR and non IBR boilers
2) Analysis of boilers – (numerical)
Equivalent evaporation,
Boiler efficiency by direct and indirect method
Energy balance,
Boiler draught (natural and artificial draught)

Text Books

1. P. K. Nag
   Engineering Thermodynamics
   Tata McGraw Hill Publications

2. R.K.Rajput
   Engineering Thermodynamics
   EVSS Thermo Laxmi Publications

3. Rayner Joel
   Engineering Thermodynamics
   ELBS Longman

4. V. P. Vasandani and D. S. Kumar
   Heat Engineering
   Metropolitan book Company, New Delhi

List of Practicals

1. Determination of calorific value using gas calorimeter.

2. Determination of calorific value using Bomb calorimeter.

3. Flue gas analysis using Orsat apparatus or Gas analyser.

4. Trial on multi stage reciprocating air compressor.

5. Determination of dryness fraction of steam using Throttling Calorimeter or Separating and Throttling ,Calorimeter.

6. Trial on boiler to determine boiler efficiency, equivalent evaporation and Energy balance.

7. Visit to any industry, which uses boiler and submission of detailed report.

8. Measurement of fuel properties such as Flash point, Pour point, Cloud Point.

9. Analysis of any thermal system using Analysis Software.

Note :

i) Sr. Number 5, 6 & 7 are compulsory Practicals.

ii) Total 8 Numbers of above listed Practicals to be performed.

202042 METALLURGY

Teaching scheme:
Lectures: 4Hrs/week
Practical: 2 Hrs/week

Examination Scheme:
Theory: 100 marks
Term work: 25 marks

Unit 1 - Structure Property Relation

Engineering metals and alloys , Elastic and plastic deformation, deformation in a single crystal and polycrystalline metal, Critical resolved shear stress, Imperfections in a crystal, plastic deformation mechanisms-slip and twin, effect of defects on deformation mechanism, work hardening, fracture in metals , changes in properties due to deformation, Re-crystallisation, cold working and hard working.

Unit 2 - Testing of metals

Concept of stress and strain, strength, elasticity, plasticity, stiffness, resilience, Toughness, Malleability, Ductility, Brittleness.

Destructive Tests like : Tension Test- Engineering and True stress-strain curves, their conversion relationships, evaluation of properties. Numerical based on tension test, engineering stress-strain diagram for ductile and brittle metal, compression test. Hardness test- Brinell. Poldi, Vickers, Rockwell, Rockwell superficial. Micro hardness test. Impact tests- Charpy and izod, , Fatigue and creep test, Erichsen cupping test , concept of fracture toughness testing

Non Destructive Testing: Visual Inspection, Magna flux, dye penetration test, sonic and ultra sonic test, radiography and eddy current test.

Examples of selection of NDT and mechanical testing methods for selected components like crankshafts, gears, razor blades, welded joints, steel and C.I. casting, rolled products.

Unit 3 - Ferrous metals and Designation

Wrought and cast components, Allotropy of Iron, Iron-carbon diagram, plain carbon steels, limitations of plain carbon steel, and advantages of alloy steels. Effect of alloying elements on mechanical properties of steel, Alloy steels, Tool steels, stainless steels, cast irons. Designation of steels and cast iron.

Unit 4 - Heat Treatment

Effect of non equilibrium cooling on microstructure and properties of steel, TTT diagram for 0.8% carbon steel only, Isothermal treatments, Continous cooling Transformation curves, Critical Cooling Rate & Heat treatments like Annealing, Normalizing, Hardening and tempering. Hardenability of steels, Jominey end quench test, surface hardening treatments- carburizing. Nitriding, Carbonitriding, tufftride, sursulf, Induction hardening and flame hardening.

Unit 5 – Powder Metallurgy and Non Ferrous Metals and alloys.

Making of Powder metallurgical component, Advantages and limitations of powder metallurgy. Production of typical P/M components, self lubricated bearing, cemented carbides, cermets, refractory metals, electrical contact materials, friction materials, and diamond impregnated tools.

Non ferrous metals and alloys- Copper and its alloys, Aluminium and its alloys, babbits.

Unit6 - Introduction to Advanced Material

Types and Properties of Composite materials, High temperature materials, Engineering ceramics & cryogenic materials.

Term Work

The students should maintain a journal keeping record of any 8 experiments from the following-

1. Tension test
2. Compression test.
3. Brinell and Poldi hardness test
4. Vickers hardness test
5. Rockwell hardness test
6. Charpy or Izod Impact test
7. Any two Non Destructive tests
8. Jominey End quench test
9. Demonstration of Annealing or Normalising or Hardening and measurement of hardness.
10. Observe and record following microstructures - Any four plain carbon steels
11. Observe and record following microstructures - Any two cast irons
    Any two non ferrous
12. Observe and record following microstructures - Heat affected zone of welded joint.
13. A report on industrial visit or component study

Books recommended

1. Engineering Metallurgy By R.A. Higgins, Viva Books Pvt Ltd
2. Properties of Engineering Materials by R.A.Higgins, Viva Books Pvt Ltd
3. Material science and metallurgy for Engineers by Dr V.D.Kodgire
4. The Science and Engineering of materials by Donald R Askeland et al, Thomson Brooks/cole

202043 FLUID MECHANICS

Teaching Scheme:
Lectures: 4 Hrs/week
Practical: 2 Hrs/week

Examination Scheme:
Theory: 100 Marks
TW : 25 Marks
Oral : 50 Marks

Section-I

UNIT 1 **Fluid Properties** **8 Hrs**

Types of fluids, Mass Density, Specific Weight, Specific Gravity, Newton's Law of Viscosity, Dynamic Viscosity, Kinematics Viscosity, Stoke's Theorem, Surface Tension Capillarity, Compressibility, Vapour pressure.

Fluid Kinematics

Types of flow- steady, unsteady, uniform, non-uniform, laminar, turbulent, One, Two and Three dimensional, compressible, incompressible, rotational, Irrotational. Stream lines, path lines, streak lines, velocity components, convective and local acceleration, velocity potential, stream function, continuity equation in Cartesian co-ordinates.

UNIT 2 **Fluid Statics** **8 Hrs**

Hydrostatic law, Pascal's law, Pressure at a point, Total Pressure, Centre of pressure, Pressure on a plane(Horizontal, Vertical, Inclined) & Curved surfaces, Archimede's Principle , Buoyancy and stability of floating and submerged bodies, Metacentric height.

UNIT 3 **Fluid Dynamics** **8 Hrs**

Introduction to Navier-Stoke's Equation, Euler equation of motion along a stream line, Bernoulli's equation, application of Bernoulli's equation to Pitot tube, Venturi meter, Orifices, Orifice meter, Triangular Notch & Rectangular Notch .(Without considering Velocity of Approach)

Section-II

UNIT 4 **8 Hrs**

Laminar Flow

Definition, relation between pressure and shear stresses, laminar flow through round pipe, fixed parallel plates.

Dimensional Analysis

Dimensions of physical quantities, dimensional homogeneity, Buckingham pi Theorem, important dimensionless numbers, Model analysis (Reynolds, Froude and Mach).

UNIT 5

Flow Through Pipes **8 Hrs**

TEL, HGL , Energy losses through pipe, Darcy-Weisbach equation, Moody diagram, Minor losses in pipes, pipes in series and parallel, Siphons, Transmission of power, Turbulent Flow, Velocity Distribution.

UNIT 6 **8 Hrs**

Boundary Layer Theory

Development of Boundary Layer on a flat plate, Laminar and Turbulent Boundary Layers, Laminar sub layer, Separation of Boundary Layer and Methods of Controlling.

Flow around Immersed Bodies

Lift and Drag, Classification of Drag, Flow around circular cylinder and Aerofoil, Development of lift on Aerofoil. Introduction to CFD Methodology (Elementary Treatment).

TERM WORK

Term work includes study of relevant theory of the topic, study of apparatus / set-up, conducting experiment/trial on the apparatus / set-up, calculations of results and conclusions.

Term work shall consist of any 8 experiments of the followings:
Out of eight experiments performed, two must be with 'C' programming.

EXPERIMENTS

1) Study of Pressure Measuring devices.
2) Determination of viscosity of liquids and its variation with temperature.
3) Stability of floating bodies and optimum loading capacity
4) Drawing Flow Net by using Electrical Analogy method.
5) Verification of modified Bernoulli's equation.
6) Calibration of Venturimeter / Orifice meter.
7) Determination of hydraulic coefficients of orifice.
8) Calibration of notch (Triangular / Rectangular).
9) Laminar and Turbulent flows by Reynolds's apparatus.
10) Flow around immersed bodies, point of stagnation, formation of wake etc by Haleshaw apparatus.
11) Determination of "Friction Factor" for Laminar and Turbulent flow through pipes of different materials.
12) Determination of minor losses due to pipe fittings (expansion, contraction, bend, elbow, gate valve, globe valve etc.).

Text Books:

1) Dr. R.K. Bansal, Fluid Mechanics, Laxmi Publication (P) Ltd. New Delhi
2) Kumar K. L., Engineering Fluid Mechanics, S.Chand & Company Ltd, Eurasia Publishing House
3) R.K. Rajput Fluid Mechanics & Hydraulic Machines, S.Chand & Company Ltd.
4) Modi P. N. and Seth S. M., Hydraulics and Fluid Mechanics, Standard Book House.

Reference Books:

1. James E. A., John and Haberm W. A., Introduction to Fluid Mechanics, Prentice Hall of India
2. Jain A. K.,Fluid Mechanics, Khanna Publishers
3. Garde R. J. and Mirajgaonkar,Engineering Fluid Mechanics,Nem Chand & Bros, Roorkee,SCITECH, Publication (India) Pvt.Ltd.
4. Dr.D.S.Kumar, Fluid Mechanics and Fluid Power Engineering, S.K.Kataria & Sons.

5. Frank M.White, Fluid Mechanics, McGraw Hill Publication.
6. James A. Fay., Introduction to Fluid Mechanics
7. Cengel & Cimbla Fluid Mechanics, TATA McGraw-Hill
8 Anderson- Fundamentals of CFD McGraw-Hill, International Edition, Mechanical Engineering Series
9. Streeter V. L. and Wylie E. B. Fluid Mechanics McGraw Hill International Book Co.

202044 Machine Drawing & Computer Graphics (MECH)

Teaching Scheme:	**Examination Scheme:**
Lecture: 1	**Term Work: 25 Marks**
Practical: 4 Hrs/week	**Practical: 50 Marks**

(No unitization is adopted in detailing of this syllabus as there is no theory examination in this subject.)

Part –I: Machine Drawing

1. **I S Conventions :-** Need and Types, I S conventions of Threads, Nuts, Bolts, Gears, Bearings, Springs, Washers, Knurling, array of holes, Ratchet & Pawl,
2. **Dimensioning :-** Placing of dimensions, Functional and Non-functional dimensions, Dimensioning common features like: Circular Arcs, Diameters, Holes, Angles, Chamfers, Tapers, Undercut, Repetitive features, Countersunk, Square, Sphere, Across flat, Threads.
3. **Limits, Fits & Dimensional Tolerances:-** Terminology**,** Necessity of Limit system, Unilateral and Bilateral Tolerances, Relation between Tolerances and Manufacturing Processes, Methods of indicating tolerances on drawings, IT grades, Systems of fits, Types fits, Selection of fits, Selection of tolerances based on fits.
4. **Geometrical Tolerances:-** Need of Geometrical Tolerances, Terminology, Tolerances for Single Features such as Straightness, Flatness, Circularity, Cylindricity. Tolerances for Related Features such as Parallelism, Perpendicularity, Angularity, Concentricity, Tolerance Symbol and Value, Indicating Geometrical Tolerances on drawings.
5. **Surface Finish:-** Surface Texture, Surface Roughness Number, Roughness Symbols, Range of Roughness obtainable with different manufacturing processes.

Part-II: Computer Graphics

1. **Script file programming**:-Introduction, Advantage, Disadvantage and Applications limited to slide shows.
2. **Data types**:- User input & output: real, integer, string, list, getreal, getint, getpoint, getstring, initget, getkword, prompt, princ, print, entget, entsel, ssget.
3. **Math operators and functions:-** add, subtract, multiply, divide, log, exponential,

   Trigonometric functions, logical operator, logical operators.
4. **String function**:-strcat, strcase, strlen, substr
5. **Data conversion functions**:itoa, rtos, atof, atoi
6. **List filtering functions**: list, car, cadr, nth, reverse, osmode, osnap, append, asso
7. **Decision making and looping**: if and while loop only, logical operators
8. **Introduction to file handling**

TERM WORK (to be completed using suitable drafting package)

Part A

- One A2 size sheet based on various IS conventions mentioned in the above syllabus [06]
- Two A2 size sheets: one on Assembly & other on Details of simple mechanical system such as vice, tool post, tailstock and valve. (Actual dismantling, measurement of dimensions of various components is necessary) Sheet on Details must include dimensional as well as geometrical tolerances and surface finish requirements [12]

Part B

- Script file programming involving only slide show
- One Programs on data types and user i/p and o/p
- One Programs on math functions [04]
- One Programs on string functions
- One Programs on data conversion functions
- One Programs on the use of list filtering
- One Programs on use of osnap and osmode
- One Programs on parametric drawing such as coupling, screw jack joint etc.
- Four Programs on decision making
- Four Programs on looping (creating polar array, resultant of forces, own polygon command, summation of series)
- One Programs on file handling to be included in parametric drawing.

Text Books:

1. Siddheshwar,
   Machine Drawing,
   Tata-McGraw Hill.
2. N. D. Bhat,
   Machine Drawing,
   Charotar Publishing Company
3. Ajeet Singh
4. ABCs of Auto LISP,
   George Omura,
   BPB Publications.

Reference Books:

1. James H. Earle
   Engineering Design Graphics
   Addison-Wesley Publishing Co.
2. K. L. Narayana and P. Kannaiah
   Machine Drawing
   New Age International Ltd
3. David I. Cook and Robert N. McDongal
   Engineering Graphics and Design with Computer Applications
   Holt-Sounders International Editors
4. IS Code SP 46

Practical Examination guidelines:-

1) One assignment to calculate tolerances. ½ hour
2) One assignment from topic 1 to 6. ½ hour
3) One assignment from topic 7. 1 hour.

207002 ENGINEERING MATHEMATICS – III (2008 Course)

Teaching Scheme:
Lectures: 4 hrs./week

Examination Scheme:
Paper: 100 marks
Duration: 3 hrs.

Section I

Unit I: Linear Differential Equations (**LDE**) of second and higher order (09 Hours)
LDE with constant coefficients, Homogeneous Equations, Cauchy's and Legendre's DE. Simultaneous & Symmetric Simultaneous DE, Mass spring mechanical systems, Damped and Undamped systems.

Unit II: Transforms (09 Hours)
a) Laplace Transform (**LT**): LT of standard functions, properties and theorems, Inverse LT, Application of LT to solve LDE.
b) Fourier Transform (**FT**): Fourier Integral theorem, Fourier transform Fourier Sine & Cosine transform, Inverse
Fourier Transform.

Unit III: Partial Differential Equations (**PDE**) (09Hours)
Basic concepts, modeling: Vibrating String, Wave equation. Method of separation of variables, Use of Fourier series, Heat equation: one and two dimensional heat flow equations, Solution by Fourier Transforms, modeling Membrane two dimensional wave equation.

Section II

Unit IV: Statistics and Probability (09 Hours)
Measure of central tendency, dispersion, Correlation and Regression, Probability, Probability distributions, Binomial, Poisson and Normal distributions, Population and Sample, Sampling Distributions, t-distribution Chi Square distribution.

Unit V: Vector Differential Calculus (09 Hours)
Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational and Conservative Fields, Scalar Potential, Vector Identities.

Unit VI: Vector Integral Calculus (09Hours)
Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stoke's Theorem.

Text Books:

1. Advanced Engineering Mathematics by Peter V. O'Neil (Cengage Learning).
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.).

Reference Books:

1. Engineering Mathematics by B.V. Raman (Tata McGraw-Hill).
2. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education).
3. Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.)
4. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
5. Applied Mathematics (Volumes I and II) by P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune).
6. Advanced Engineering Mathematics with MATLAB, 2e, by Thomas L. Harman, James Dabney and Norman Richert (Brooks/Cole, Thomson Learning).

202046 MANUFACTURING PROCESSES

Teaching Scheme:
Lectures: 3 Hrs/week

Examination Scheme:
Theory: 100 Marks

SECTION – I

UNIT I: Casting Processes

Sand Casting, Pattern types, materials, pattern making allowances, moulding sand types, properties and testing. Hand and machine moulding processes and equipments.

Core - types and manufacturing. Gating Systems. Cleaning and finishing. Defects in casting. Shell moulding, investment casting, die casting, centrifugal casting. Continuous casting**.**

(07 Hrs)

UNIT II: Metal Forming Processes

Introduction to hot working and cold working.
Forming processes
Rolling- Types of rolling mills, Roll forming, Roll forging
Forging- Drop, press and upset, defects
Extrusion- Direct and indirect
Drawing- Wire drawing, tube drawing
Swaging, shot peening. **(07 Hrs)**

UNIT III: Joining Processes

Surface preparation and various joints.
Arc Welding- Theory, SMAW, GTAW, FSAW, Submerged arc welding, Stud Welding.
Resistance welding- Theory, Spot, Seam and Projection weld process.
Gas Welding.
Soldering, brazing and braze welding.
Use of adhesives for joining - Classification of adhesives, types of adhesives, applications.

(07 Hrs)

SECTION -II

UNIT IV: Centre Lathe Machine

Introduction to centre lathe, types of lathes. (Capstan and turret)
Construction and working of lathe, attachments and accessories, lathe mechanisms.
Thread cutting and taper turning methods.
Simple numerical on calculation of machining time.

(07Hrs.)

UNIT V: **Milling, Drilling, Planning and Boring Machines**

Milling machine: Types of milling, Construction, Working and Mechanism of Column and Knee types milling machine. Cutter- types and geometry and their application, Speed, feed and depth of cut. Simple numerical to calculate machining time. Universal Dividing head, methods of indexing- Simple, Compound, Differential. Only simple numerical on indexing.

Drilling Machine: Twist drill geometry, tool holder, Types of drilling machine, Types of drills and operations, speed, feed of drill, Simple numerical to calculate machining time.

Introduction to planar and boring machines. **(07 Hrs.)**

UNIT VI: **Grinding Machines**

Abrasive machining process machines – Types, construction and operation.
Grinding wheel –Designation, mounting and dressing of grinding wheels.
Superfinishing processes - honing, lapping, buffing and burnishing. **(07 Hrs.)**

Text Books:

1. Hajara Choudhari, Bose S. K.

Elements of Workshop Technology Vol I, II
Asia Publishing House

2. P. N. Rao

Manufacturing Technology Vol I & II
Tata McGraw Hill Publishing Co

Reference Books:

1. R. K. Jain

Production Technology
Khanna Publishers

2. P. C. Sharma

Production Technology
Khanna Publishers

3. Chapman W. A. J.

Workshop Technology Vol I, II, III
ELBS Publishers

4. HMT

Production Technology
Tata McGraw Hill Publishing Co

5. Degarmo, Black and Kosherth

Materials and Processes in manufacturing 8th Edition
Prentice Hall of India

202047 Theory of Machines - I

Teaching Scheme:
Lectures: 4Hrs/week
Pract: 2Hrs/week

Examination Scheme:
Theory: 100 Marks (4Hrs)
TW: 50 Marks

UNIT 1

(10 Hrs.)

Fundamentals of Kinematics and Mechanisms

- Kinematic link, Types of links, Kinematic pair, Types of constrained motions, Types of Kinematic pairs, Kinematic chain, Types of joints, Mechanism, Machine, Degree of freedom (Mobility), Kutzbach crieterion, Grubler's criterion.
- Four bar chain and its inversions, Grashoff's law, Slider crank chain and its inversions, Double slider crank chain and its inversions.
- Pantograph, Swinging/Rocking mechanisms, Geneva mechanism.
- Equivalent linkage of mechanisms.
- Steering gear mechanisms : Condition for correct steering, Davis steering gear mechanism, Ackermann steering gear mechanism.

UNIT 2

(8Hrs.)

Velocity and Acceleration Analysis of Simple Mechanisms : Graphical Methods-I

- Relative velocity method : Relative velocity of a point on a link, Angular velocity of a link, Sliding velocity, Velocity polygons for simple mechanisms.
- Relative acceleration method : Relative acceleration of a point on a link, Angular acceleration of a link, Acceleration polygons for simple mechanisms.
- Instantaneous center of rotation (ICR) method: Defination of ICR, Types of ICRs, Methods of locating ICRs, Kennedy's Theorem, Body and space centrode.

UNIT 3

(8Hrs.)

Velocity and Acceleration Analysis of Mechanisms: Graphical Methods-II

- Velocity and acceleration diagrams for the mechanisms involving Coriolis component of acceleration.
- Klein's construction.

UNIT 4

(8Hrs.)

Kinematic Analysis of Mechanisms : Analytical Methods

- Analytical method for displacement, velocity and acceleration analysis of slider crank mechanism.
- Position analysis of links with vector and complex algebra methods, Loop closure equation, Chace solution, Velocity and acceleration analysis of four bar and slider crank mechanisms using vector and complex algebra methods.
- Hooke's joint, Double Hooke's joint.

UNIT 5

(7 Hrs.)

Introduction to Synthesis of Linkages

- Steps in synthesis process : Type, number and dimensional synthesis.
- Tasks of Kinematic synthesis : Path, function and motion generation (Body guidance).
- Precision Positions, Chebychev spacing, Mechanical and structural errors, Branch defect and order defect, Crank Rocker mechanisms.
- Graphical synthesis : Two and three position synthesis using relative pole method and inversion method for single slider crank and four bar mechanism, Three position motion synthesis of four bar Mechanism.
- Analytical synthesis : Derivation of Freudenstein's equation, Three position function generation using Freudenstein's equation .

UNIT 6

(7 Hrs.)

Static and Dynamic Force Analysis

- Theory and analysis of Compound Pendulum, Concept of equivalent length of simple pendulum, Bifilar suspension, Trifilar suspension.

- Dynamics of reciprocating engines: Two mass statically and dynamically equivalent system, correction couple, static and dynamic force analysis of reciprocating engine mechanism (analytical method only), Crank shaft torque, Introduction to T-θ diagram.

Term Work

The term work shall consist of:

[A] Laboratory Experiments:

Any four of the following experiments shall be performed and record to be submitted in the form of journal.

1. Demonstration and explanation of configuration diagram of working models based on four bar chain, single slider crank mechanism, and double slider crank mechanism for various link positions (any two models).
2. Identifying different mechanisms used for motion conversion in sewing machine.
3. To determine the mass moment of inertia of a connecting rod using a compound pendulum method.
4. To determine the mass moment of inertia of a flat bar using bifilar suspension method.
5. To determine the mass moment of inertia of a flywheel/gear/circular disc using trifilar suspension method.
6. To determine the angular displacements of input and output shafts of single Hooke's joint for different shaft angles and verification of the results using computer programme.

[B] Drawing Assignments (4 sheets of ½ imperial size) :

1. To study and draw (any four) mechanisms for practical applications such as: mechanical grippers in robot, lifting platform, foot pump, toggle clamp, folding chair etc.; straight line mechanisms such as : Peaucellier Mechanism, Scott Russell Mechanism, Grasshopper Mechanism etc., for various link positions.

2. Two problems on velocity and acceleration analysis using Graphical methods i.e., polygons or ICR (Based on Unit 2).

3. Two problems on velocity and acceleration analysis using Graphical methods i.e., polygons involving Coriolis component or Klein's construction (Based on Unit 3).

4. Two problems based on graphical three position function generation, using either relative pole method or inversion method.

[C] Assignments:

The following two assignments shall be completed and record to be submitted in the form of journal.

1. Computer programming for velocity and acceleration analysis of slider cranks mechanism.

2. One problem on velocity and acceleration analysis using:
   a) Vector algebra,
   b) Complex algebra, and
      comparison of results.

Text Books:

1. Rattan S. S., "Theory of Machines", Tata McGraw Hill.
2. Ballaney P. L., "Theory of Machines", Khanna Publishers, Delhi.

Reference Books:

1. Thomas Bevan, "Theory of Machines", CBS Publishers & Distributors, Delhi.
2. Shigley J.E. and Uicker J.J., "Theory of Machines and Mechanisms", McGraw Hill, Inc.
3. Myszka D. H., "Machines and Mechanisms - Applied Kinematic Analysis", Prentice – Hall of India.
4. Ghosh Amitabh and Malik A.K., "Theory of Machines and Mechanisms", East-West Press.
5. Groover M.P., "Industrial Robotics", McGraw Hill International.
6. Hall A.S., "Kinematics and Linkages Design", Prentice-Hall.
7. Hartenberg and Denavit, " Kinematic Analysis and Synthesis of Mechanisms".
8. Erdman, A. G. & Sandor, G.N., "Mechanism design, Analysis and synthesis", Vol 1, Prentice –Hall of India.
9. Erdman, A. G. & Sandor, G.N., "Advance Mechanism design", Vol 2, Prentice –Hall of India.
10. Wilson, C E Sandler, J P "Kinematics and Dynamics of machinery", Pearson Education.

202048.Internal Combustion Engines

Teaching Scheme:
Theory: 4 hrs/week.
Practical: 2 hrs/batch

Exam. Scheme:
Paper: 100 marks
Practical Exam: 50marks.
T**W** **:** 25 marks.

Unit No 1. **(8 hrs)**

Air standard cycles and fuel-air cycles

Assumptions, Otto, Diesel & Dual cycles, comparison of cycles, fuel air cycle, Valve timing diagram, Actual engine cycle.

Unit No 2. **(8 hrs)**

S.I. Engines

Theory of Carburetion, Types of carburetors , Electronic fuel injection system, GDI,, Combustion in spark Ignition engines, stages of combustion, flame propagation, rate of pressure rise, abnormal combustion, Phenomenon of Detonation in SI engines, effect of engine variables on Detonation. Combustion chambers. Rating of fuels in SI engines, Additives. (Numericals on carburetion)

Unit No 3. **(8 hrs)**

C.I. Engines

Fuel supply system, types of fuel pump, injector and distribution system, Combustion in compression ignition engines, stages of combustion, factors affecting combustion, Phenomenon of knocking in CI engine. Effect of knocking, Types of combustion chambers, rating of fuels in CI engines. Dopes & Additives, Comparison of knocking in SI & CI engines,

Concepts of Supercharging and Turbo charging.(Numericals on fuel injuction)

Unit No 4. **(8 hrs)**

Engine systems and components

a. Ignition system.(battery, magneto & electronic)
b. Lubrication system
c. Engine starting system.
d. Engine cooling system
e. Governing system (quality and quantity hit & miss governing)
f. Intake and exhaust systems (two valves & four valves)
g. Drive train (cam shaft, valves etc.)
   (Detail discussion is expected).

Unit No. 5. **(8 hrs)**

Performance characteristics &Testing of I.C. Engine

Introduction to Indian. Standards for testing of I.C. Engine, Mean effective pressure, indicated power, brake power, friction power, Methods to determine power and efficiencies Variables affecting performance of engine, characteristic curves, heat balance sheet, Methods of improving engine performance (Numericals) & simple numericals on super & turbocharged engines.

Unit No 6 **(8 hrs)**

Fuels and Emission of I.C. Engines.

Chemical structure of the Petroleum, Refining process for petroleum, important qualities of the Engine fuels - (SI & CI engines), Alternate fuels (SI & CI engines)- Liquid fuels, gaseous fuels, hydrogen engines (LPG, HC NG (15%, 20%, 25 % Blends Hydrogen and Biofuels), diesel, Gasoline fuels Indian specifications.

Air pollution due to IC engine, Engine emissions, Hydrocarbon emissions, (HC) & PPM & Carbon monoxide emissions (CO), oxides of Nitrogen (NO_x) Euro norms , Bharat stage norms, Introduction to EDC and IDC , Introduction to carbon credit, Emission control methods for SI and CI engines, Electronic control unit, Cat con, EGR

Concept of hybrid vehicles. Electrical battery pack Specification of civic; Toyota etc.

Term Work:

The file should consist of Minimum 10 Experiments

List of Practicals

1. Study of fuel injection system in SI & CI engines.
2. Study of Electronic ignition systems.
3. Study of alternative fuels for I.C. Engines.
4. Trial on Multi cylinder Petrol/ Gas engine for determination of Friction power.
5. Trial on diesel engine to determine various efficiencies, SFC and Heat balance sheet.
6. Demonstration & study of commercial exhaust gas analyzers.
7. Trial on IC Engines to plot P-Ɵ diagram.
8. Trial on variable speed diesel / petrol engine.
9. Trial on variable compression ratio engine.
10. Assignment on Programming to predict the effect of variable compression ratio on I.C. Engine.
11. Assignment on Programming for Air standard cycle analysis.
12. Assignment on Programming for generating heat balance sheet.
13. Assignment on current and latest trends in IC Engine.
14. Visit to Automobile service station.

Note :- 1) Total 10 numbers of above listed practicals are to be performed.
2) Serial no. 4,5,6,7 & 14 are compulsory practicals.
3) Minimum two programming assignments are expected.

Reference Books:

1. Heywood, John B. Internal Combustion Engine Fundamentals. McGraw-Hill
2. Internal Combustion Engines: Applied Thermo sciences, 2nd Edition, Colin R. Ferguson, Allan T. Kirkpatrick.
3. Obert E.F., "Internal Combustion Engines Analysis and Practice", International Text Books Co., Scrantron, Pennsylvania.
4. William H.Crouse, "Automotive Engines", McGraw-Hill.
5. Pulkrabek "Engineering Fundamentals of the Internal Combustion Engines", Practice Hall of India.
6. Erjavec, "Automotive technology: A system approach", Thomson Learning series.
7. BIS standards
8. SAE published books.

TEXT BOOKS

1. Ganesan.V., "Internal Combustion Engines", Tata McGraw-Hill Publishing Co., New Delhi.
2. M.L. Mathur and R.P. Sharma, "A course in Internal combustion engines", Dhanpat Rai & Sons, Delhi.
3. K.K. Ramalingam, "Internal Combustion Engines", Scitech Publications, Chennai.
4. Dr. V.M. Domkundwar, "A Course in Internal Combustion Engines", Dhanpat Rai & Co, Delhi.
5. R. Yadav, "I.C. Engines" Central book Depot, Alahabad.

202049 GEOMETRIC MODELING (Mech)

Teaching Scheme; Examination scheme:

Lectures: Nil **Practical Exam– 50 Marks**

Practical; 4hrs/week **Term work -25 Marks**

1) Introduction

Strengths and weaknesses of conventional 2D drawing. Types of geometric modeling, wire frame modeling, surface modeling, solid modeling (CSG & B-rep) advantages, disadvantages and application. File Formats and Data exchange.

2) Sketching

Sketching, line, circle, arc, spline. Filleting, trimming. Dimensioning linear, angular, diameter, radius, modifying dimension. Constraints parallel, perpendicular, co-incident, vertical, horizontal, tangent, symmetric.

3) Solid Modeling Sketch based features extrude, revolve, sweep, variable section sweep, loft. Add, subtract, intersection. Use of part library threads, tapped holes, ribs, nuts, bolts etc. Datum planes, points, curves etc. parent child relationship. Modifying commands fillet, chamfer, array, copy, mirror etc. Design tables.

4) Surface modeling techniques

Tabulated surface, revolved surface, swept surface, lofted surface, edge defined surface. Multi-section sweep & Variable section sweep

5) Assembly & Mechanism

Assembly top down and bottom up approach, constraints, mate, align, Joints

6) Drafting & Detailing of 3 D Models

Detailing generating views, sectional views, Orthographic views, isometric Dimensioning views, adding dimensional and geometric tolerances, surface finish. Creating BOM.

Term work: (Using any 3 D Modeling package)

1. Two assignment on sketching. (6Hrs.)
2. One assignment on surface modeling (4 Hrs.)
3. Two assignment on Part modeling. (10 Hrs.)
4. Two assemblies of machine component like knuckle joint, coupling, gate valve, stop valve Bench vice, tool post . (18 Hrs.)
5. Detailing of any one assembly and parts made in assignment 4. (6Hrs.)
6. Creating mechanism to plot displacement, velocity & acceleration diagram of one mechanism like slider crank, four bar mechanism(6Hrs.)

* Practical Exam should be based on part and assembly modeling .

203050: ELECTRICAL TECHNOLOGY

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs/week	Theory: 100 Marks
Practical: 2 Hrs/week	Term work: 25 Marks

UNIT 1 **(08 Hours)**

a) Electrical Power Measurement: - Measurement of active and reactive power in three phase balanced loads by using one wattmeter & two wattmeter, effect of power factor on wattmeter reading.

b) Electrical Energy Measurement:- Single Phase & three phase energy meter (construction and Working), Use of CT & PT for measurement of Power / Energy in single phase and three phase system (Theoretical Treatment only), standard specifications of single and three phase energy meter.

c) Tariff-introduction, objectives & Details of H.T. and L.T tariff, TOD tariff, advantages and improvement of power factor (Theoretical Treatment only)

d) Illumination:- Various terms related to illumination, types & requirement of good lighting scheme, special purpose lighting

UNIT 2 **(08 Hours)**

a) Single phase transformer: - Types, KVA rating, approximate equivalent circuit, voltage regulation and efficiency of transformer, condition for maximum efficiency.

b) Three phase transformers: Types of transformer connection (star/star, star/delta, delta/star, and delta/delta) and applications based on connections. (Theoretical Treatment only) Introduction of power transformer, distribution transformer, study of typical distribution transformer substation, specifications of transformer (KVA rating, voltage ratio, current rating)

c) Three phase Induction Motor:- Constructional feature, working principle of three phase induction motors, types; torque equation, torque slip characteristics; power stages; efficiency; types of starters; methods of speed control & Industrial applications.

UNIT 3 **(06 Hours)**

a) **Single phase induction motors:** Types, construction, working principle of split phase and shaded pole type induction motors, applications. Specifications of induction motors (KW rating, rated voltage, current rating, frequency, speed, class of insulation)

b) **Synchronous Generator**: Constructional features (Salient and non- salient),working principle, e m f equation, synchronous speed of an alternator, concept of synchronous reactance and impedance, phasor diagram of loaded alternator, voltage regulation of alternator by direct loading method and synchronous impedance method. Specifications of synchronous generator

UNIT 4

D.C. Machines (06 Hours)

Construction, working principle of D.C. generator, emf equation of D C generator. (Theoretical concept only).

Working principle of D.C. motor. Types of D. C. motor, back emf , torque equation for D.C. motor, characteristics of D. C. motor (series, shunt and compound), starters of D.C. shunt and series motor, methods for speed control of D.C shunt and series motors, Industrial applications.

Special purpose motors: Construction, working principle, characteristic and applications of stepper motors, A.C. and D.C servomotors, universal motors, Industrial applications.

UNIT 5 POWER SEMICODUCTOR DEVICES SUCH AS (08 Hours)

SCR:- Construction detail, V-I Characteristics, Methods to turn ON, switching action during ON & OFF, specification, Concept of commutation of SCR. applications

DIAC:- Construction, V-I Characteristics

TRIAC:- Construction, V-I Characteristics, turning ON process.

MOSFET:- Construction, transfer Characteristics, output characteristics, Methods to turn ON & OFF, applications

IGBT:- Construction detail, transfer Characteristics, output characteristics, Methods to turn ON & OFF, applications GTO Construction ,working and characteristic

UNIT 6 (08 Hours)

Drives:-Advantages of Electrical Drives, Individual & Group drives, selection of drives depending on load characteristics.

Speed Control:- Single phase full converter fed D.C. Drives, Three phase converter fed D.C. Drives, Chopper Drives, two quadrant & four quadrant chopper drives, stator voltage control of three phase induction motor, frequency control of three phase induction motor, V/F control of three phase induction motor.

Term Work

A term work shall consist of a record of eight practical of the following:
(Experiment no. 9 & 10 are compulsory, 6 experiments out of expt. No 1 to 8).

1. Speed control of a D. C. shunt motor by armature voltage and flux control methods.

2. Load test on a D. C. shunt motor.
3. Load test on a D. C. series motor.
4. Measurement of active power in a three phase balanced inductive load using two wattmeter method.
5. Regulation of an alternator by synchronous impedance method.
6. Regulation of an alternator by direct loading method.
7. Load test on a three phase induction motor.
8. Study of a) D.C. motor starters, b) three phase induction motor starter.
9. Study of V-I characteristics of SCR & TRAIC
10. Study of a distribution transformer substation and HT/LT energy bill.

Books to be referred

1. Electrical Technology
   B. L.Theraja, S Chand Publication Co Ltd.
2. Ashfaq Husain,
   Fundamentals of Electrical Engineering'
   Dhanpat Rai & Co.
3. Electrical machines
   D P Kothari and I J Nagrath
   Tata McGraw Hill ,Third Edition

4. Electrical Machinery
   S.K. Bhattacharya
   TTTI Chandigad
5. Electrical Technology
   Edward Hughes
   Pearson Education
6. Art and Science of Utilization of Electrical Energy
   H Pratap
   Dhanpat Rai and Co ,Third Edition
7. Power Electronics
   Dr. P.S. Bhimbra
   Khanna Publication

202051 STRENGTH OF MACHINE ELEMENTS (SE Mech& Mech .- S/W)

Teaching Scheme; **Examination scheme:**
Lectures; 4hrs/week **Paper: 100 Marks**

Unit - 1

Simple stresses & strains

Revision of Concept of stresses & strains (linear, lateral, shear, thermal & volumetric). Hooke's law, Poisson's ratio, Modulus of Elasticity, Modulus of Rigidity, Bulk Modulus. Stress-strain diagrams for ductile & brittle materials. Various strengths of material- Yield strength, Ultimate tensile strength etc,

Concept of 3D stress state. Interrelation between elastic constants, Proof stress & True stress & strain. Axial force diagrams, stresses and strains in determinate & indeterminate homogeneous & composite bars under concentrated loads & self weight.

Temperature stresses in simple & composite members.

Strain energy due to axial load (gradual, sudden & impact), strain energy due to self weight.

Unit - 2

Shear Force & Bending Moment Diagrams.
Shear forces & bending moments of determinate beams due to concentrated loads, uniformly distributed loads, uniformly varying loads & couples, relation between SF & BM diagrams for cantilevers, Simply supported beam. Maximum bending movement & positions of points of contra flexure, construction of loading diagrams & BMD from SFD & construction of loading diagram & SFD from BMD.

Slope & deflection of beams - relation between BM & slope, slope & deflection of determinate beams, double integration method (Macaulay's method), derivation of formula for slope & deflection for standard cases

Unit- 3

Principal stresses & strains
Normal & shear stresses on any oblique plane. Concept of principal planes derivation of expression for principal stresses & maximum shear stress, position of principal planes & planes of maximum shear, graphical solution using Mohr's circle of stresses, combined effect of axial force, bending moment & torsional moment on circular shafts (solid as well as hollow)

Theories of elastic failure: Maximum principal stress theory, maximum shear stress theory, maximum distortion energy theory, maximum strain theory – their applications & limitations.

Unit - 4

Stresses in Machine Elements.

Bending stresses :
Theory of simple bending, assumptions, derivation of flexural formula, second moment of area of common cross sections(rectangular, I,T,C) with respective centroidal & parallel axes, bending stress distribution diagrams, moment of resistance & section modulus calculations.

Shear stresses :
Concept, derivation of shear stress distribution formula, shear stress distribution diagrams for common symmetrical sections, maximum and average shears stresses, shear connection between flange & web.

Unit - 5

Torsion
Stresses, strain & deformations in determinate shafts of solid &
hollow, homogeneous & composite circular cross section subjected to twisting moment, derivation of torsion equation, stresses due to combined torsion, bending & axial force on shafts.

Buckling of columns:
Concept of buckling of columns, derivation of Euler's formula for buckling load for column with hinged ends, concept of equivalent length for various end conditions. Limitations of Euler's formula, Rankine's formula, safe load on columns.

Unit- 6

Design Process:
Machine Design, Traditional design methods, Basic procedure of Machine Design, Forming Design specifications, Design for:- 1) functional requirement, 2) customer orientation 3) Safety requirement & 4) Analysis for use. Requisites of design engineer, Design of machine elements, Sources of Design data , Use of Design data book, Use of standards in design, Selection of preferred sizes, Design Synthesis, Creativity in design. Use of internate for gathering information & Consideration of energy requirement, product life cycle & design for environment.

Design of Simple Machine parts:
Factor of safety, Service factor, Design of simple machine parts - Cotter joint, Knuckle joint and Levers, Eccentric loading , Stresses in curved beams (for circular cross-section only).

Reference books

1) Gere and Timoshenko - Mechanics of material, CBS Publisher, 1984.
2) E.P. Popov - Introduction to Mechanics of Solids, Prentice Hall Publication.
3) Singer and Pytel - Strength of materials, Harper and row Publication.
4) Timoshenko and Young - Strength of materials, CBS Publication.
5) Beer and Johnston - Strength of materials, CBS Publication.
6) Shigley J.E. and Mischke C.R. – "Mechanical Engineering Design" – McGraw Hill Publication Co. Ltd.
7) Spotts M.F. and Shoup T.E. – "Design of Machine Elements" – Prentice Hall International.
8) Bhandari V.B. – "Design of Machine Elements" – Tata McGraw Hill Publication Co. Ltd.
9) Black P.H. and O. Eugene Adams – "Machine Design" – McGraw Hill Book Co. Inc.
10) PSG Design Data Book
11) S.S. Rattan Strength of material – Tata McGraw Hill Publication Co. Ltd.
12) Dr. R. K. Bansal Strength of material, Laxmi publication Pvt. Ltd., New Delhi
13) Ramamurtham, Strength of material, Dhanpatrai Publication.

202052 Production Technology

Teaching Scheme: **Examination Scheme:**
Lectures: 3 Hrs/week **Theory: 100 Marks**

SECTION I

UNIT 1 **Theory of Metal Cutting** **7 Hrs**

Cutting tool, tool geometry, Concept of cutting variables, cutting action and effect of these on cutting forces. Merchant's circle of forces. Estimation of cutting forces. Machinability. Tool life, Tool wear, economics of machining, cutting fluids.
Measurement of cutting forces by Tool dynamometers, Cutting power estimation
Cutting tools: Design of single point , form tools (Graphical method).

UNIT 2 **Broaching, Gear & Thread Manufacturing** **7 Hrs**

(a) Broaching
Introduction to broaching, broach tool geometry, Types of broaching machines and operations. Numericals on broach design. 0
(b) Gear Manufacturing

Different Gear manufacturing Methods: Gear hobbing, Gear shaping, Gear shaving. Gear finishing processes: Gear grinding and lapping.
(c) Thread Manufacturing

Thread cutting, chasing and dies, milling, rolling.
Thread finishing processes: grinding and lapping.

UNIT 3 **CNC Technology** **7 Hrs**
Introduction and working of NC, CNC, DNC machines. CNC axis and drives, Introduction to Automatic Tool Changer and Automatic pallet changer. Principles and block diagram of Machining centers, advantages and applications. CNC programming for simple parts on Lathe and Drilling machines. Introduction to FMS.

SECTION II

UNIT 4 **Sheet Metal Working** **7 Hrs**
Introduction to various sheet metal operations. Types of dies, accessories and punches for press working, materials for punches and dies. Die design for blanking, piercing, bending and drawing. Numericals on clearance analysis, centre of pressure, different forces, press tonnage, blank size, number of draws, strip layout, sheet utilization ratio, methods of reducing forces.

UNIT 5 **Non Conventional Methods of Machining** **7 Hrs**

Introduction, Types of Non Conventional Methods of Machining, applications, working Principles, Process Parameters for: Chemical Machining, ECM, EDM, EBM, IBM, PAM, LBM, AJM and USM.

UNIT 6 **Principles of Jigs and Fixtures** **7 Hrs**

Definitions, elements of jigs and fixtures, basic principles and guidelines for design. Types of jigs and fixtures.
Locating devices- types of locators and their selection.
Clamping devices – basic principles, types and their selection.
Power work holding devices, Jig bushes, indexing methods, modular fixture, fabrication methods.
Working drawings (two views) for design of simple components.

Text Books:

1.P. N. Rao
Manufacturing Technology Vol I & II
Tata McGraw Hill Publishers
2. P. C. Sharma
Production Engineering
Khanna Publishers

Reference Books:

1. R. K. Jain
Production Technology
Khanna Publishers
2. HMT
Production Technology
Tata McGraw Hill Publishers
3. S. K. Basu
Fundamentals of Tool Design
Oxford IBH
4. Tool Engineering Handbook
ASTME
5. P.H.Joshi, Jigs & Fixtures, TMH Publication.
6. P.H.Joshi, Press Tool Design, TMH Publication.
7. Kempster, Jigs & Fixture
8. M.C.Shaw, Metal Cutting, Pearsons Publication.
9. Dr. K.C.Jain & A.K.Chitale
A Text book of Production Engineering, PHI Publication
10. Chapman W. A. J.
Workshop Technology Vol I, II, III, ELBS Publishers
10. Hoffman
Introduction to Jigs and Fixtures
Golgotha Publications

215053 Workshop Practice

Teaching Scheme: Practical 2hr/week

Term Work: - 25 Marks

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Each candidate shall be required to complete and submit the following term work:

1. Jobs
    a. Plane turning, taper turning, and thread cutting – one job
    b. Forging and grinding of lathe tool with one knife and other end vee – one job
    c. Making a simple solid pattern involving wood turning – one job
    d. Welding gas or ark – one job
2. Journal and demonstration:
    A journal containing record of following assignments based on the following topics (with sketches and relevant description)

1. Block diagrams (Any two)
    a. Lathe
    b. Universal milling machine
    c. Radial drilling machine
    d. Cylindrical grinder
2. Mechanisms (Any two)
    a. All geared head stock of a center lathe
    b. Spindle arbor (assembly) drive of a milling machine.
    c. Crank and slotted lever quick return drive of shaping machine
    d. Spindle assembly of a drilling machine
3. Casting and super finishing processes (Any two)
    a. Types of pattern
    b. Different casting methods
    c. Honing
    d. Buffing
4. Welding (Any two)
    a. Classification of welding processes
    b. Different types of welding symbols and joints
    c. Testing of welded joints
    d. Welding defects

Note: -

Industrial visit / audio visual films may be arranged for covering above topics

Text Books:-

1) Hajara Choudhary, Bose S K, Elements of Workshop Technology Vol I and II, Asia Publishing House.
2) Rao P N, Manufacturing Technology and Foundry, Forming and Welding, Tata McGrawHill publishing Company
3) Parmar R S, Welding Process and Technology, Khanna Publisher.
4) Reference Book: Jain R K, Production Technology, Khanna Publisher